

Amendments to the Claims

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently amended) A luminescent device comprising:

an organic luminescent element comprising:

an anode;

a cathode; and

a hole transporting region provided between the anode and the cathode, the hole transporting region comprising a first layer, a second layer, and a mixed layer provided between the first layer and the second layer;

wherein the first layer includes a hole injecting material, the mixed layer includes the hole injecting material and a hole transporting material, and the second layer includes the hole transporting material,

wherein the hole injecting material is smaller in ionization potential than the hole transporting material,

wherein the hole transporting material is larger in hole mobility than the hole injecting material, and

wherein there is a concentration gradient such that a concentration of the hole transporting material is increased in a direction toward the cathode from the anode and a concentration of the hole injecting material is decreased in a direction toward the cathode from the anode.

2. (Canceled)

3. (Previously Presented) A luminescent device according to claim 1, wherein the hole injecting material comprises a phthalocyanine compound.

4. (Previously Presented) A luminescent device according to claim 1, wherein the hole transporting material comprises an aromatic amine-based compound.

5. (Original) A luminescent device according to claim 1, wherein the organic luminescent element has a luminescence from a triplet excited state.

6. (Previously Presented) A luminescent device according to claim 1, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio device.

7. (Currently amended) A luminescent device comprising:

an organic luminescent element comprising:

an anode;

a cathode; and

an electron transporting region provided between the anode and the cathode, the electron transporting region comprising a first layer, a second layer, and a mixed layer provided between the first layer and the second layer;

wherein the first layer includes an electron injecting material, the mixed layer includes an electron transporting material and the electron injecting material, and the second layer includes the electron transporting material,

wherein the electron injecting material is larger in electron affinity than the electron transporting material,

wherein the electron transporting material is larger in electron mobility than the electron injecting material, and

wherein there is a concentration gradient such that a concentration of the electron injecting material is increased in a direction toward the cathode from the anode and a concentration of the electron transporting material is decreased in a direction toward the cathode from the anode.

8. (Canceled)

9. (Previously Presented) A luminescent device according to claim 7, wherein the electron injecting material is selected from the group consisting of alkali metal halogenide, a metal complex having a quinoline skeleton, a metal complex having a benzoquinoline skeleton, an oxadiazole derivative, or a triazole derivative.

10. (Previously Presented) A luminescent device according to claim 7, wherein the electron transporting material is selected from the group consisting of a metal complex having a quinoline skeleton, a metal complex having a benzoquinoline skeleton, an oxadiazole derivative, a triazole derivative, or a phenanthroline derivative.

11. (Original) A luminescent device according to claim 7, wherein the organic luminescent element has a luminescence from a triplet excited state.

12. (Previously Presented) A luminescent device according to claim 7, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio device.

13-24. (Canceled)

25. (Currently amended) A luminescent device comprising:

an organic luminescent element comprising:

an anode;

a cathode;

a luminescent layer provided between the anode and the cathode; and

a blocking layer adjacent to the luminescent layer, being provided between the anode and the cathode;

wherein the blocking layer comprises a blocking material and a material contained in the luminescent layer,

wherein the blocking material and the material contained in the luminescent layer have electron transport property,

wherein an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit in the blocking material is larger than an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit in a material contained in the luminescent layer, and

wherein there is a concentration gradient that a concentration of the material contained in the luminescent layer is decreased in a direction toward the cathode from the anode and a concentration of the blocking material is increased in a direction toward the cathode from the anode.

26. (Canceled)

27. (Original) A luminescent device according to claim 25, wherein the blocking material is selected from the group consisting of an oxadiazole derivative, a triazole derivative, or a phenanthroline derivative.

28. (Original) A luminescent device according to claim 25, wherein the organic luminescent element presents luminance caused from a triplet excited state.

29. (Previously Presented) A luminescent device according to claim 25, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio device.

30. (Currently amended) A luminescent device comprising:
an organic luminescent element comprising:

an anode;

a cathode;

a first mixed region contiguous to the anode, comprising a hole injecting material and a hole transporting material;

a second mixed region contiguous to the first region, comprising the hole transporting material and a host material;

a third mixed region contiguous to the second mixed region, comprising the host material and a blocking material; and

a fourth mixed region provided between the third mixed region and the cathode, comprising an electron injecting material and an electron transporting material,

wherein there is at least one concentration gradient in the first region such that a concentration of the hole injecting material is decreased in a direction toward the second region from the anode and a concentration of the hole transporting material is increased in a direction toward the second region from the anode, in the second region such that a concentration of the hole transporting material is decreased in a direction toward the third region from the first region and a concentration of the host material is increased in a direction toward the third region from the first region, and in the third region such that a concentration of the host material is decreased in a direction toward the fourth region from the second region and a concentration of the blocking material is increased in a direction toward the fourth region from the second region.

31-113. (Canceled)

114. (Currently amended) A luminescent device comprising:

an organic luminescent element comprising:

an anode;

a cathode;

a first mixed region adjacent to the anode, comprising a hole injecting material and a hole transporting material;

a second mixed region adjacent to the cathode, comprising an electron injecting material and an electron transporting material; and

a third mixed region provided between the first mixed region and the second mixed region, comprising the hole transporting material and the electron transporting material, wherein there is a concentration gradient in the first mixed region that a concentration of the hole transporting material is decreased in a direction toward the third region from the anode and a concentration of the hole injecting material is increased in a direction toward the third region from the anode, in the second region that a concentration of the electron transporting material is increased in a direction toward the third region from the cathode and a concentration of the electron injecting material is decreased in a direction toward the third region from the cathode, and in the third region that a concentration of the electron transporting material is decreased in a direction toward the first region from the second region and a concentration of the hole transporting material is increased in a direction toward the first region from the second region.

115-117. (Canceled)

118. (Original) A luminescent device according to claim 114, wherein a luminescent material is doped in a portion of the third region.

119. (Original) A luminescent device according to claim 118, wherein the luminescent material is a triplet luminescent diode.

120. (Previously Presented) A luminescent device according to claim 114, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio device.

121. (Currently Amended) A luminescent device comprising:
an organic luminescent element comprising:
an anode;
a cathode;

a first mixed region contiguous to the anode, comprising a hole injecting material and a hole transporting material;

a second mixed region contiguous to the first region, comprising the hole transporting material and a host material;

a third mixed region contiguous to the second mixed region, comprising the host material and a blocking material; and

a fourth mixed region provided between the third mixed region and the cathode, comprising the blocking material and an electron injecting material;

wherein there is at least one concentration gradient in the first region that a concentration of the hole injecting material is decreased in a direction toward the second region from the anode and a concentration of the hole transporting material is increased in a direction toward the second region from the anode, in the second region that a concentration of the hole transporting material is decreased in a direction toward the third region from the first region and a concentration of the host material is increased in a direction toward the third region from the first region, and in the third region that a concentration of that host material is decreased in a direction toward the fourth region from the second region and a concentration of the blocking material is increased in a direction toward the fourth region from the second region.

122-124. (Canceled)

125. (Original) A luminescent device according to claim 121, wherein there is a concentration gradient in the fourth region that a concentration of the blocking material is decreased toward the cathode from the third region and a concentration of the electron injecting material is increased toward the cathode from the third region.

126. (Original) A luminescent device according to claim 121, wherein a luminescent material is doped in a portion of both second region and third region.

127. (Original) A luminescent device according to claim 126, wherein the luminescent material is a triplet luminescent diode.

128. (Original) A luminescent device according to claim 121, wherein the blocking material is an electron transporting material.

129. (New) A luminescent device comprising:
an anode over a substrate;
a first layer comprising a hole injecting material and a hole transporting material over the anode;
a second layer comprising a host material over the first layer;
a third layer comprising a blocking material over the second layer;
a fourth layer comprising an electron injecting material over the third layer; and
a cathode over the fourth layer,
wherein a luminescent material is doped in the second layer and the third layer.

130. (New) A luminescent device according to claim 129, wherein the first layer is a hole transporting mixed layer.

131. (New) A luminescent device according to claim 129, wherein the second layer is a bipolar-natured mixed layer.

132. (New) A luminescent device according to claim 129, wherein the third layer is a blocking mixed layer.

133. (New) A luminescent device according to claim 129, wherein the fourth layer is an electron transporting mixed layer.

134. (New) A luminescent device according to claim 129, wherein the blocking material serves as an electron transporting material.

135. (New) A luminescent device according to claim 129, wherein the luminescent material is a triplet light emitting material.

136. (New) A luminescent device according to claim 129, wherein the triplet light emitting material has a central metal selected from the group consisting of platinum and iridium.

137. (New) A luminescent device according to claim 129, wherein the luminescent material is a material selected from the group consisting of a metal complex and a fluorescent dye.

138. (New) An electronic appliance having the luminescent device according to claim 129.

139. (New) An electronic appliance according to claim 129, wherein the electronic appliance is selected from the group consisting of a car audio, a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, and a cellular phone.

140. (New) A luminescent device according to claim 129, wherein the luminescent device is a passive matrix luminescent device.

141. (New) A luminescent device according to claim 129, wherein at least one of the anode and the cathode is electrically connected to an active element such as a thin film transistor and a MOS transistor.

142. (New) A luminescent device according to claim 129, wherein the luminescent device is an organic luminescent device.